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1.Introduction

To operate LHD and to study a recycling control, neutral gas pressure measurement is important. Fast Ionization Gauge (FIG) is an ionization gauge which is operational in a high magnetic field, and already used in tokamaks [1,2]. In order to measure gas pressure of the LHD, the FIG is installed on the LHD port.

Although the FIG is operational in a high magnetic field, the output value is changed by magnetic field. It means that calibration is necessary to measure precise pressure. To study an effect of a magnetic field, the FIG is installed in TPD before installation in the LHD and tested.

2.Structure of the FIG

FIG consists of a gauge head, filament current power supply, pre-amplifier, and main controller.

The FIG gauge head consists of a filament, potential controller, electron collector, and ion collector. They are set linearly along to magnetic field line. Molecular of gas is ionized by electron and turns around the magnetic field line and is guided to the ion collector. So, in general, ion current with a magnetic field is more than ion current without magnetic field.

The main controller changes electric potential frequently to measure not only ion current (J_i) but also electron (emission) current (J_e). Pressure is proportional to J_i/J_e .

Optical cables connect the filament power supply, pre-amplifier, and main control unit. Parameters, e.g. gain, emission current, and so on, can be changed remotely by sending GP-IB command.

3.Experimental

The FIG gauge head is set at a center of solenoid coils of TPD. Fig.1 shows a schematic view of an apparatus for the test. At first, without magnetic field, gas controller introduces hydrogen gas, and a pressure is measured using normal ionization gauge, which is well calibrated. Keeping the gas flow rate and changing coil current, J_i and J_e are measured. The measurement has been carried out under several pressure conditions.

At the same time, remote control test has been carried out, and FIG control unit has been successfully controlled using GP-IB command.

4.Results

Fig.2 shows the relationship between pressure and J_i/J_e . It is found that linearity is very well. And it is confirmed that the ion current becomes higher as the magnetic field become higher.

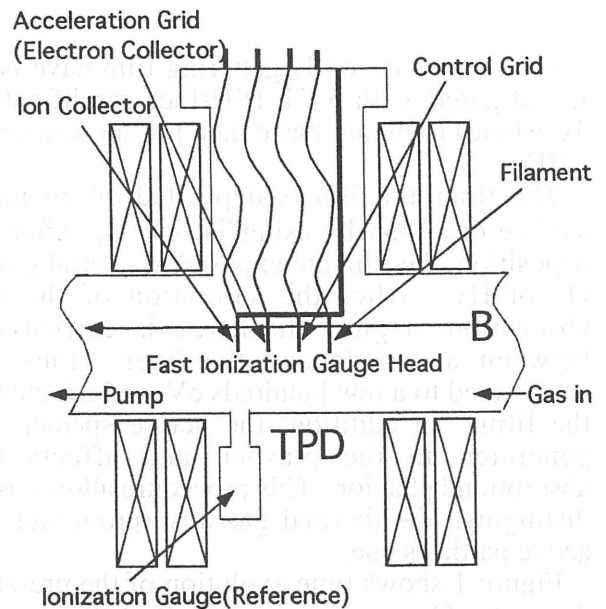


Fig.1 Apparatus for testing of the fast ionization gauge

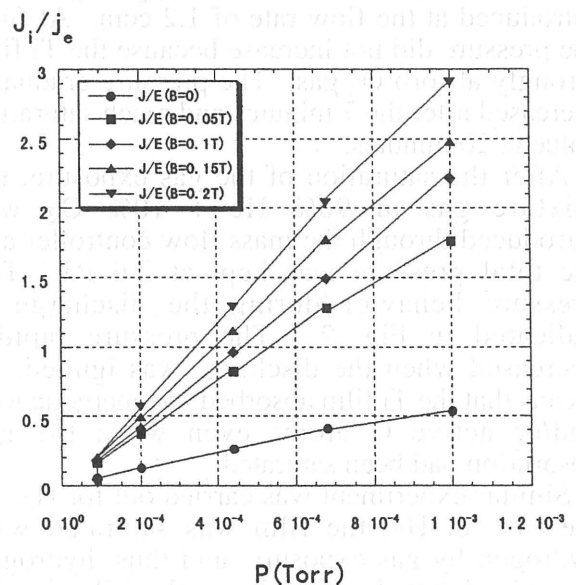


Fig.2 J_i/J_e vs Pressure

Reference

- [1] G.Haas, et.al, J.Nucl. Mater. 121,155(1984)
- [2] C.C.Klepper, et.al, J of Vac. Sci. and Technol. A11(2),446 (1993)